

under §§ 23.173 through 23.181. In addition, the airplane must show suitable stability and control “feel” (static stability) in any condition normally encountered in service, if flight tests show it is necessary for safe operation.

#### § 23.173 Static longitudinal stability.

Under the conditions specified in § 23.175 and with the airplane trimmed as indicated, the characteristics of the elevator control forces and the friction within the control system must be as follows:

(a) A pull must be required to obtain and maintain speeds below the specified trim speed and a push required to obtain and maintain speeds above the specified trim speed. This must be shown at any speed that can be obtained, except that speeds requiring a control force in excess of 40 pounds or speeds above the maximum allowable speed or below the minimum speed for steady unstalled flight, need not be considered.

(b) The airspeed must return to within the tolerances specified for applicable categories of airplanes when the control force is slowly released at any speed within the speed range specified in paragraph (a) of this section. The applicable tolerances are—

(1) The airspeed must return to within plus or minus 10 percent of the original trim airspeed; and

(2) For commuter category airplanes, the airspeed must return to within plus or minus 7.5 percent of the original trim airspeed for the cruising condition specified in § 23.175(b).

(c) The stick force must vary with speed so that any substantial speed change results in a stick force clearly perceptible to the pilot.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-14, 38 FR 31820 Nov. 19, 1973; Amdt. 23-34, 52 FR 1828, Jan. 15, 1987]

#### § 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) *Climb.* The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with—

- (1) Flaps retracted;
- (2) Landing gear retracted;

(3) Maximum continuous power; and  
(4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) *Cruise.* With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to  $V_{NO}$  or  $V_{MO}/M_{MO}$ , as appropriate, except that the speed need not exceed  $V_H$ —

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than  $1.3 V_{S1}$ ; or

(ii) For airplanes with  $V_{NE}$  established under § 23.1505(a), at speeds greater than  $V_{NE}$ ; or

(iii) For airplanes with  $V_{MO}/M_{MO}$  established under § 23.1505(c), at speeds greater than  $V_{FC}/M_{FC}$ .

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than  $1.4 V_{S1}$ ; or

(ii) At speeds greater than  $V_{FC}/M_{FC}$ ; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) *Landing.* The stick force curve must have a stable slope at speeds between  $1.1 V_{S1}$  and  $1.8 V_{S1}$  with—

(1) Flaps in the landing position;

(2) Landing gear extended; and

(3) The airplane trimmed at—

(i)  $V_{REF}$ , or the minimum trim speed if higher, with power off; and

(ii)  $V_{REF}$  with enough power to maintain a 3 degree angle of descent.

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#### § 23.177 Static directional and lateral stability.

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to